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A new *Tanycricos* La Rivers, 1971 (Hemiptera: Heteroptera: Naucoridae) from the Cyclops Mountains, New Guinea, with a key to species

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Abstract: *Tanycricos cyclops* sp. nov. from Cyclops Mountains, northern New Guinea, is described and illustrated. An updated key and annotated checklist to the species of *Tanycricos* La Rivers, 1971 is also provided. The present range of *Tanycricos* is discontinuous, with seven of the nine known species inhabiting New Guinea's 1300 km long and about 150 km wide fold-and-thrust belt (Central Cordillera), one species occuring on a microcontinent (Arfak Mountains on Doberai Peninsula), and yet another one on an accreted island arc terrane (Cyclops Mountains of northern New Guinea).

Key words: Taxonomy, new species, area of endemism, New Guinea, annotated checklist.

Introduction

Tanycricos La Rivers, 1971 is a genus of creeping water bugs, or Naucoridae, and a member of the tribe Tanycricini La Rivers, 1971, which is endemic to New Guinea. The genus was originally proposed to hold four species from the Central Cordillera of New Guinea (La Rivers 1971) and considered endemic to the montane perennial streams of this largest tropical island (D. Polhemus & J. Polhemus 1986; D. Polhemus 1999a). Tanycricini was established by La Rivers (1971: 3) within the Cheirochelinae Montandon, 1897 based on a set of external morphological features, including the absence of an "antennal groove," the head with the "posterior interocular head space a simple, variably-depthed curve", the "elongated shape" of the body, the presence of an "oval, static sense organ along the ventral lateral margin of prothorax near or at the anterior angle", and the "middle tibia armed with at least of four terminal transverse rows of spines". In fact, most of these features are plesiomorphic within the Naucoridae, as subsequently noted by D. Polhemus (1999b). Tanycricini currently contains three Papuan endemic genera – *Idiocarus* Montandon, 1897, *Nesocricos* La Rivers, 1971 and *Tanycricos* (La Rivers 1971; Schuh & Slater 1995).

Tanycricos was long considered endemic to Central Highlands of New Guinea (D. Polhemus & J. Polhemus 1986; D. Polhemus 1999a), until recently when a new species was described from the Doberai (or Vogelkop) Peninsula (Sites & Suputa 2008) of far western New Guinea. Up to the present publication, eight species of *Tanycricos* were known, seven of these from the Central Cordillera and one from Arfak Mountains of the Doberai Peninsula (La Rivers 1971; D. Polhemus & J. Polhemus 1986; D. Polhemus 1999a; Sites & Suputa 2008).

In the present paper, another new species, *Tanycricos cyclops* sp. nov., is described and illustrated based on material from the Cyclops Mountains, an accreted island arc terrane lying in the central coastal sector of northern New Guinea, and a new record for *T. acumentum* La Rivers, 1971 is presented. An updated, annotated checklist and updated key to *Tanycricos* are also presented and certain biogeographical peculiarities in the distribution of *Tanycricos* species are discussed.

Material and methods

All type label text for specimens from the Naturkundemuseum Erfurt (Germany) is reproduced with no additions. Each of the type specimens of the newly described species in the Naturkundemuseum Erfurt is provided with a black-framed label on red paper as "HOLOTYPUS" or "PARATYPUS", respectively. Authors' comments are placed in square brackets.

For specimens collected by the second author (DP), complete locality data is provided. These data are contained on labels for alcohol-preserved specimens, with a more restricted set of data present on labels for dry-pinned specimens. The collection number accompanying these data refers to a collection locality numbering system used by the second author to cross reference specimens, label data, photographs, and collection field notes.

For morphological studies, a Leica S6D binocular stereomicroscope was used. Images were taken with Canon EOS 77D camera and Canon MP-E 65 mm lens. Helicon Focus ® software was used for image stacking. Further image manipulations were conducted using GNU Image Manipulation program (GIMP). For proper examination the specimens were relaxed in water. Abdomens were detached and cleaned for several hours in room temperature 10% KOH. After the study, genitalia and terminalia were mounted on mounting cards near their respective specimens.

The Papuan Region as considered here is a zoogeographic term in the sense of Gressitt (1982), Beehler *et al*. (1986), Riedel (2002), and Telnov (2011).

Acronyms for scientific collections:

BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.;
NME	Naturkundemuseum Erfurt, Germany;
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A.

Results

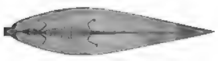
***Tanycricos acumentum* La Rivers, 1971** (Figs 1–5)
Material studied: 1 brachypterous ♂ NME, INDONESIA E, New Guinea, Papua Prov., Star Mountains, Oksibil 8.6 km WNW, road to Serambakot vill., 4°52'53"S, 140°33'22"E, 1500 m, 11.III.2018, perennial stream midreach, sandy ground / small rocks (NME).

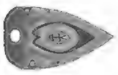
Note: This species is reported from most of New Guinea's Central Cordillera at elevation over 1000 m (D. Polhemus 1999a). The new locality is the third one in Star Mountains, located about 30 km south of the nearest hitherto known locality, "Juliana Bivak", which is the locus typicus for this species (cf. La Rivers 1971). The gradient of the stream on a road to Serambakot is less than 30%, therefore we consider it the midreach of a perennial stream as classified by D. Polhemus & Allen (2007b). The habitus and images of the male genitalia of this species are provided here for the first time.

In Papua New Guinea, introduced rainbow trout have been documented to prey upon *T. acumentum*, with unknown impact on the population of this Papuan endemic (D. Polhemus & J. Polhemus, 1986).

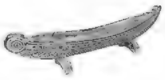
***Tanycricos cyclops* sp. nov.** (Figs 6–17)
http://zoobank.org/B369E6F2-73C2-45CE-833F-2C7CC6EDC648
Holotype ♂ NME: INDONESIA E, New Guinea, Papua Prov., Sentani, Cyclops Mts., 02°32'04"S, 140°30'47"E, 550 m, 03.IV.2018, perennial stream, headwater [printed] [macropterous specimen].
Paratypes 15 specimens: INDONESIA, New Guinea: 2 macropterous ♀♀ NME: same label as holotype; 3♂, 3♀ & 6 immatures BPBM, 1 brachypterous ♂ & 1 brachypterous ♀ USNM, Cyclops Mountains, rocky stream above Pos Tujuh. NW of Sentani, 260–300 m., 02°32'26"S, 140°30'47"E, water temp. 22.5° C., 18 September 2000, 14:00–16:30 hrs., CL 7145, D. A. Polhemus [printed] (1 brachypterous ♂, 1 brachypterous ♀ dry pinned USNM, 1 macropterous ♂, 1 brachypterous ♂, 1 macropterous ♀, 3 4th instar immatures, 3 3rd instar immatures USNM, all preserved in alcohol) [all of the above records refer to the same stream, with collections taken at slightly different elevational ranges along the catchment].

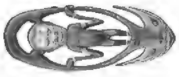
Derivatio nominis: Toponymic. Named after Cyclops Mountains, locus typicus of this species.
Measurements: Holotype, macropterous male, total body length 15.2 mm; head length 2.6 mm, head width across eyes 3.3 mm, pronotal length 2.5 mm, maximum length from base to anterolateral angle 3.5 mm, pronotal width across midlength 4.9 mm maximum pronotal width at base 5.8 mm, length from base of the scutellum to the tip of abdomen length 10 mm, combined maximum width of wings 6.7 mm.
Description, macropterous male (Fig. 6): Head and pronotum dorsally dirty yellowish, dark pattern on head medially covering most of vertex except narrow area at posteromedial corner of compound eye, and strongly constricting anteriad





and subparallel narrow dark line on mesal margin of compound eye, pronotal disc with dark V-shaped median and paired parenthesis-shaped sublateral lines. Scutellum black-brown with dirty yellowish apex and paired irregular markings on anterior margin (interconnected or broadly interrupted by dark colouration). Forewings dark-brown to black-brown, each with an irregularly shaped, dirty-yellowish median spot and less prominent pale spot on each wing at the apex of the scutellum. Abdominal segments brown dorsally and ventrally, paler yellowish-brown on terga and sterna VI-VII. Legs dirty-yellowish to yellowish-brown, profemora narrowly darkened meso-longitudinally on dorsal surface. Venter of head, pro- and mesonotum dirty-yellowish. Head subopaque dorsally and ventrally, with very large and prominent compound eyes. Head anterior margin obtusely pointed, projecting beyond compound eyes 26-27% of head length. Head basal margin strongly convex between non- to hardly convergent compound eyes. Compound eye subtruncate on the inner, irregularly rounded on the outer lateral margin. Frons slightly raised dorsally, vertex flattened. Shallow, rather broad dorsal longitudinal impression at inner margin of each compound eye. Anteclypeus anterior to compound eyes gradually converging anteriad; apex narrowly rounded, dorsally shallowly longitudinally impressed on either side along slightly convex midline. Labrum directed anteroventrad, recessed. Antennae short and slender, most of terminal antennomere extending beyond anterior margin of compound eye. Dorsal setae inconspicuous, mainly arranged in longitudinal impressions along inner margin of compound eyes. Pronotum dorsally slightly convex but flattened anteromesad and broadly along basal margin. Maximum width across posterolateral angles. Anterior margin deeply concave, basal margin truncate. Lateral margins delicately depressed, slightly narrowing anteriad. Anterolateral angles acutely angulate, posterolateral angles rather narrowly rounded. Scutellum basally 4.6 mm wide, exposed part medially 2.9 mm long, with slightly sinuate lateral margins, evenly flattened dorsally. Hemelytra broadly rounded apically, extending towards genital operculum, not exceeding end of abdomen. Embolium broad, embolar suture distinct. Clavus present, claval suture complete, distinct. Faint venation of hemelytron visible with transmitted light. Metathoracic wing not folded, four longitudinal veins and two cells present. Prosternum medially carinate. Proepimeron with elongate-ovoid, golden sense organ lateral to procoxal acetabulum, its inner margin touching prosternum, with thin extension over a deep pit at posterior margin behind procoxa. Abdomen with terga densely dark setose medially, glabrous laterally. Terga III-VIII with marginal row of short, stout, dirty-yellow, spine-like setae and submarginal row of long, golden, suberect setae. Posterolateral angles of terga II–IV nearly squared, V nearly squared on left but acutely angulately produced on the right angle, VI produced as slightly acute lobe, VII–VIII produced as elongate, narrowly rounded lobes (Figs 6 & 11). Posterior margin of tergum V distinctly asymmetrically sinuous, with short and rather deep median emargination, expanded posteriorly, covering most of tergum VI in dorsal aspect. Posterior margin of tergum VI slightly asymmetrically sinuous, of tergum VII - symmetrical, broadly emarginate medially. Sterna II–VII with spiracle 1/5 distance from lateral margin to midline. Posterior margin of sternum V subtruncate, VI - sinuous, VII – emarginate with strongly projecting apically rounded median process (Fig. 12). Genital capsule (Figs 15–17) yellowish-brown, with delicate short and dense golden setation on exposed areas, broadly rounded on posterior margin; posterior margin with 3–4 inconspicuous flat transverse ridges. Left paramere oriented to right, overlapping right paramere and median lobe, moderately broad and stout in basal half, strongly narrowed in apical half, slightly angled anteriad, with slightly concave ventral surface, rounded apically (Figs 15–17). Right paramere somewhat L-shaped, broad and stout, narrowed towards obtusely rounded apex, broadly excavated dorsolaterally (except at basal part) to embrace cylindrical median lobe (Figs 15–17). Legs strong. Profemur delicately tuberculate dorsally, inner margin with thick pad of short, stiff golden setae, outer margin all along with long and dense brownish-golden setae and a row of small black tubercles posterior of setae. Protibia and single tarsus slightly curved, dorsally delicately impressed, inner margin in upper part with thick pad of short, golden setae. Protarsal claw single, slightly curved. Meso- and metafemora delicately spinulose on both anterior and posterior margin; spines are larger and denser on outer margins. Upper part of posterior margin of meso- and metatibiae with a row of long dense golden swimming setae. Meso-and metatibia dorsally delicately spinulose. Mesotibia dorsally at distal margin with profuse, long, golden swimming setae. Metatibia dorsally with row of very long, dense, brown, suberect swimming setae. Meso- and metatarsomeres on inner margins with a row of dense golden swimming setae. Pretarsal claws





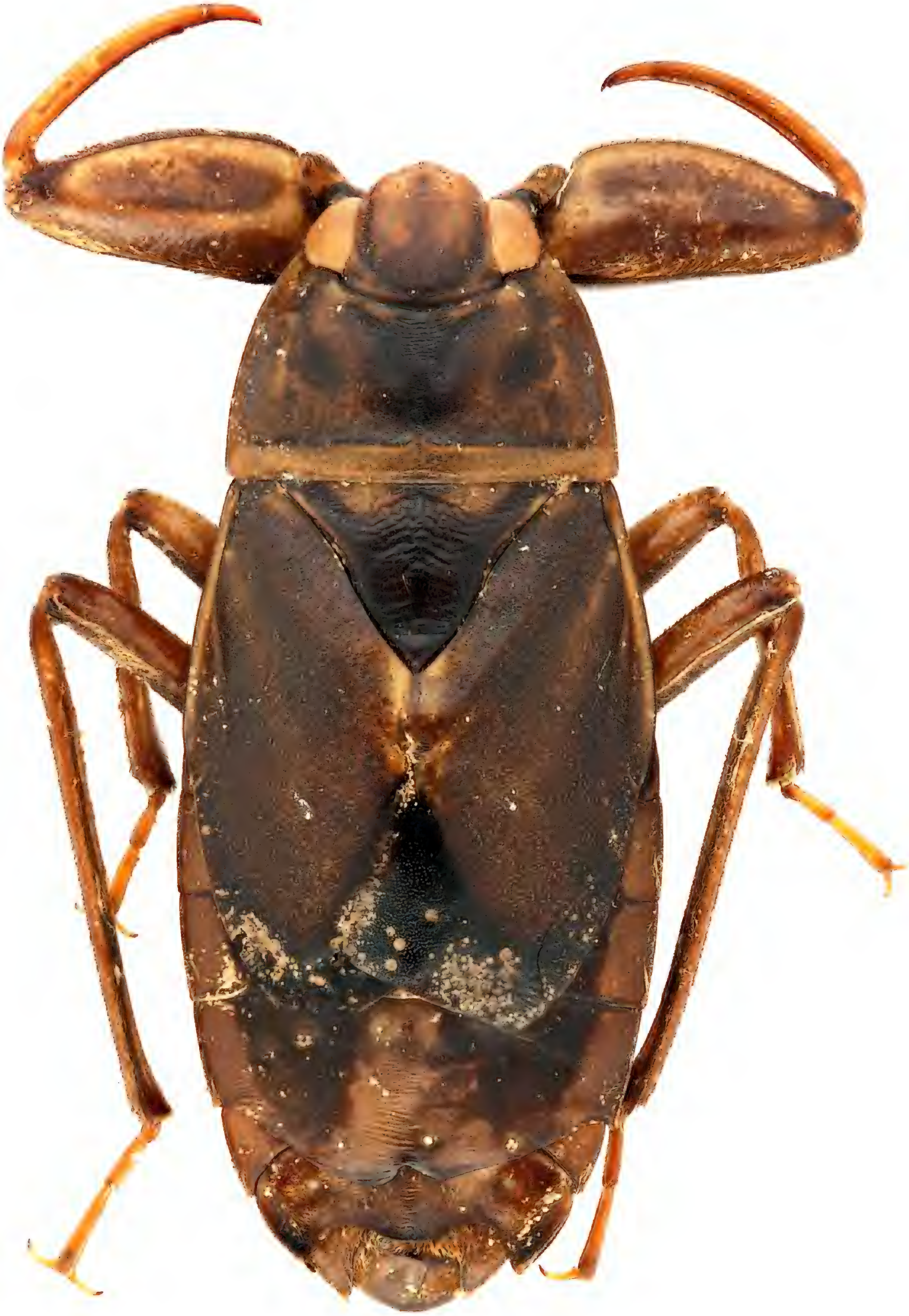
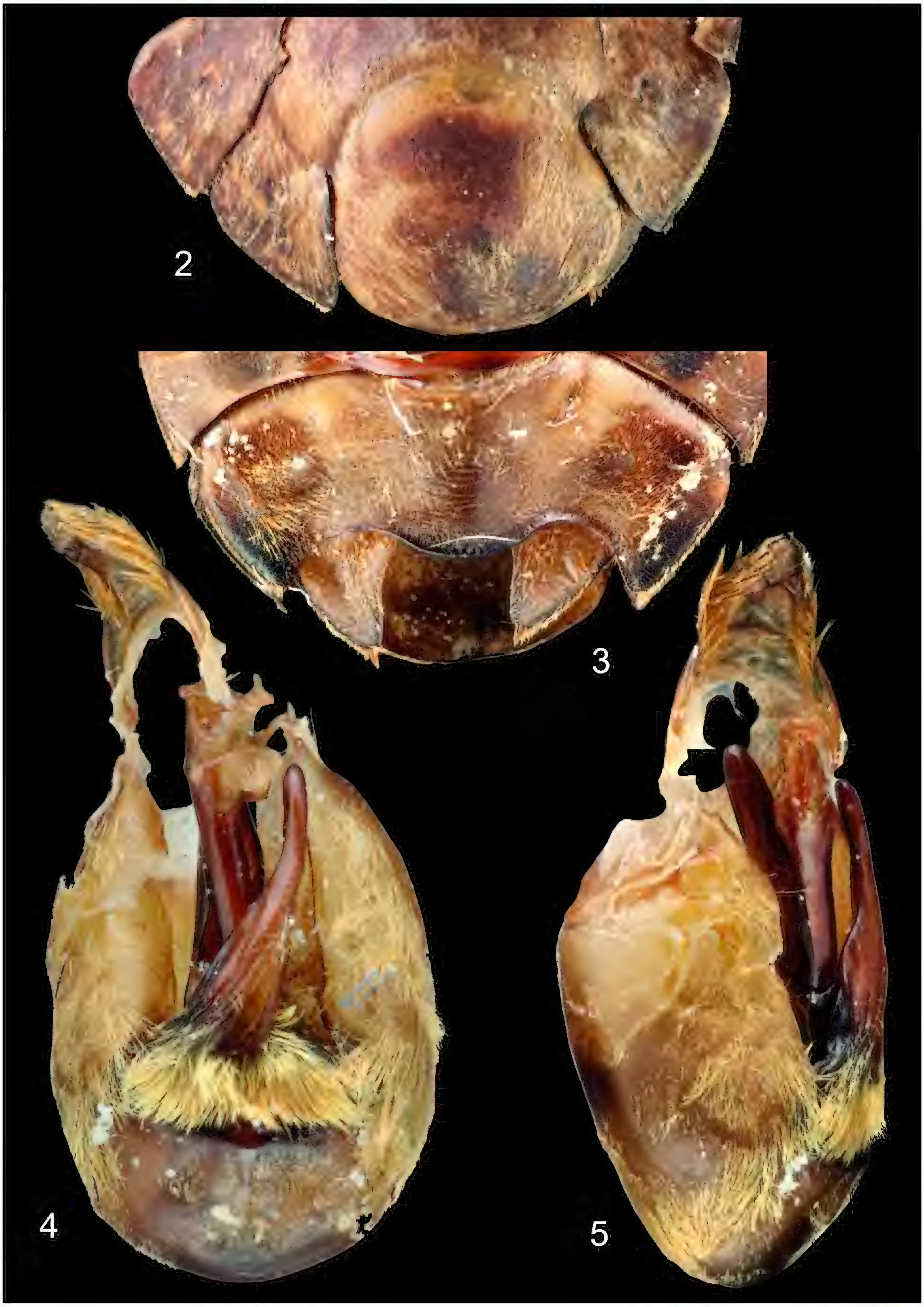


Figure 1. *Tanycricos acumentum* La Rivers, 1971, brachypterous ♂ from WNW of Oksibil, Star Mountains, New Guinea, habitus, dorsal view.



Figures 2–5. *Tanycricos acumentum* La Rivers, 1971, ♂ from WNW of Oksibil, Star Mountains, New Guinea. 2–3 – Terminal abdominal segments, dorsal (2) and ventral (3) view; 4–5: Genital capsule and aedeagus, ventral (4) and lateroventral (5) view [not to scale].

non-appendiculate, strongly curved, with setiform parempodia. Length of mesotarsomere 1 – 0.25 mm, 2 – 0.75 mm, 3 (pretarsal claw excluded) – 1 mm, length of metatarsomere 1 – 0.32 mm, 2 – 0.7 mm, 3 – 12 mm.

Macropterous female (Fig. 7): Body length 14.7–15.8 mm. Generally more robust than macropterous male, abdominal segments wider than those of male. Posterolateral angles of terga II–IV nearly squared, without asymmetry, tergum V – subsquared, less than right angled as on previous tergum, VI – symmetrical, acutely angulately produced, VII - symmetrical, acutely angulately produced and slightly emarginate preapically on lateral margin (Figs 7 & 13). Posterior margin of sterna V-VI slightly sinuous to subtruncate, symmetrical, of sternum VII – slightly asymmetrically sinuous (Fig. 14). Subgenital plate broadly subtriangular, sinuous on lateral margins, with deep, moderately broad, U-shaped median incision (Fig. 14).

Brachypterous male (Fig. 8): Similar to macropterous male in general structure and coloration, with following exceptions: body length 16.5 mm, maximum width (across posterior margin of hemelytra) 7.6 mm.; head length 2.9 mm, head width across eyes 3.6 mm, pronotal length 2.5 mm, maximum pronotal width at base 5.7 mm, scutellum length 2.7 mm, width across base 4.4 mm, length of hemelytra along commissure 7.6, length along outer margin 7.3 mm. Pronotum less swollen and campanulate than in winged form, posterolateral angles not as broadly flared; center of scutellum flat, not swollen; hemelytra extending onto anterior margin of 6th visible abdominal tergum, coloration predominantly dark brown with embolar margins narrowly yellowish-brown, posterior margins slightly concave anteriorly.

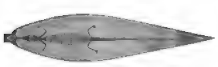
Brachypterous female: Similar to macropterous male in general structure and coloration, with following exceptions: Body length 16.7 mm, maximum width (across posterior margin of hemelytra) 7.3 mm.

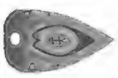
3rd instar (Fig. 9): Similar in general form to adult in regard to mesosternal scuplture and leg armature, but with wings and scutellum not fully developed; body length 13 mm, maximum width (across metathorax) 4.9 mm, head width/length 2.6/1.5 mm, pronotum width/length 4/1.4 mm, mesonotum width/length 4.7/1.4 mm, metanotum width/length 4.9/1.2 mm, abdomen width (base)/ length 4.7/4.6 mm, lengths of abdominal terga I–VIII 0.4/0.8/0.9/0.8/0.5/0.5/0.3/0.4 mm respectively. Lateral portions of mesonotum somewhat produced as incipient wing pads, reaching two-thirds of length along lateral margins of metanotum, lateral mesonotum/lateral metanotum lengths 1.8/0.8 mm respectively; posterior margin of mesonotum sinuate, produced into a broad, obtusely convex process medially, anteriorly depressed basomedially, with triangular form of scutellum faintly indicated. Suture between abdominal terga II and III with pair (1+1) of transversely elongate sulci bearing thin, golden cuticle. Elongate fovea on ventral side of anterolateral pronotal angle above fore acetabula only incipiently developed. Venter of abdomen completely covered with fine, tightly appressed, shining golden hydrofuge pile, with round glabrous patches at spiracles and as paired, longitudinally elongate patches on each abdominal segment on both sides of midline.

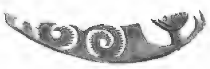
4th instar (the description of the 4th instar only includes differences from that of the 3rd instar) (Fig. 10): Similar in general form to 3rd instar, but larger, with lateral mesonotal wing pads more fully developed; body length 14.5 mm, maximum width (across posterior thorax) 6.7 mm, head width/length 3.7/3.3 mm, pronotum width/length 5.0/2.2 mm, mesonotum width/length 6.7/1.7 mm, metanotum width/length 6.7/1.3 mm, abdomen width (base)/ length 6.7/6.0 mm, lengths of abdominal terga I–VIII 0.3/0.9/1.1/1.0/0.8/0.6/0.3/1.0 mm respectively. Lateral portions of mesonotum produced posteriorly as a pair (1+1) of flaps representing incipient forewing development, covering most of lateral metanotum, lateral mesonotum/lateral metanotum lengths 3.5/0.4 mm respectively. Suture between abdominal terga II and III lacking transversely elongate sulci bearing thin, golden cuticle. Elongate fovea on ventral side of anterolateral pronotal angle above fore acetabula partially developed, bearing golden pruinosity.

Differential diagnosis: *Tanycricos cyclops* sp. nov. is readily different from congeners primarily in the shape of male genitalia (parameres, in particular) and male and female abdominal terminalia.

Ecology: Specimens were taken in the foothills of the Cyclops Mountains, at several points between 260 and 550 m elevation along the course of a clear, steeply descending stream in a bed of very large boulders, with a high waterfall at the upstream end of the reach sampled (for holotype). Specimens were dwelling on boulders at depths of 1-3 cm. Specimens collected by the second author were taken in kick samples from swift water runs, occurring amid cobbles and large rocks overlying







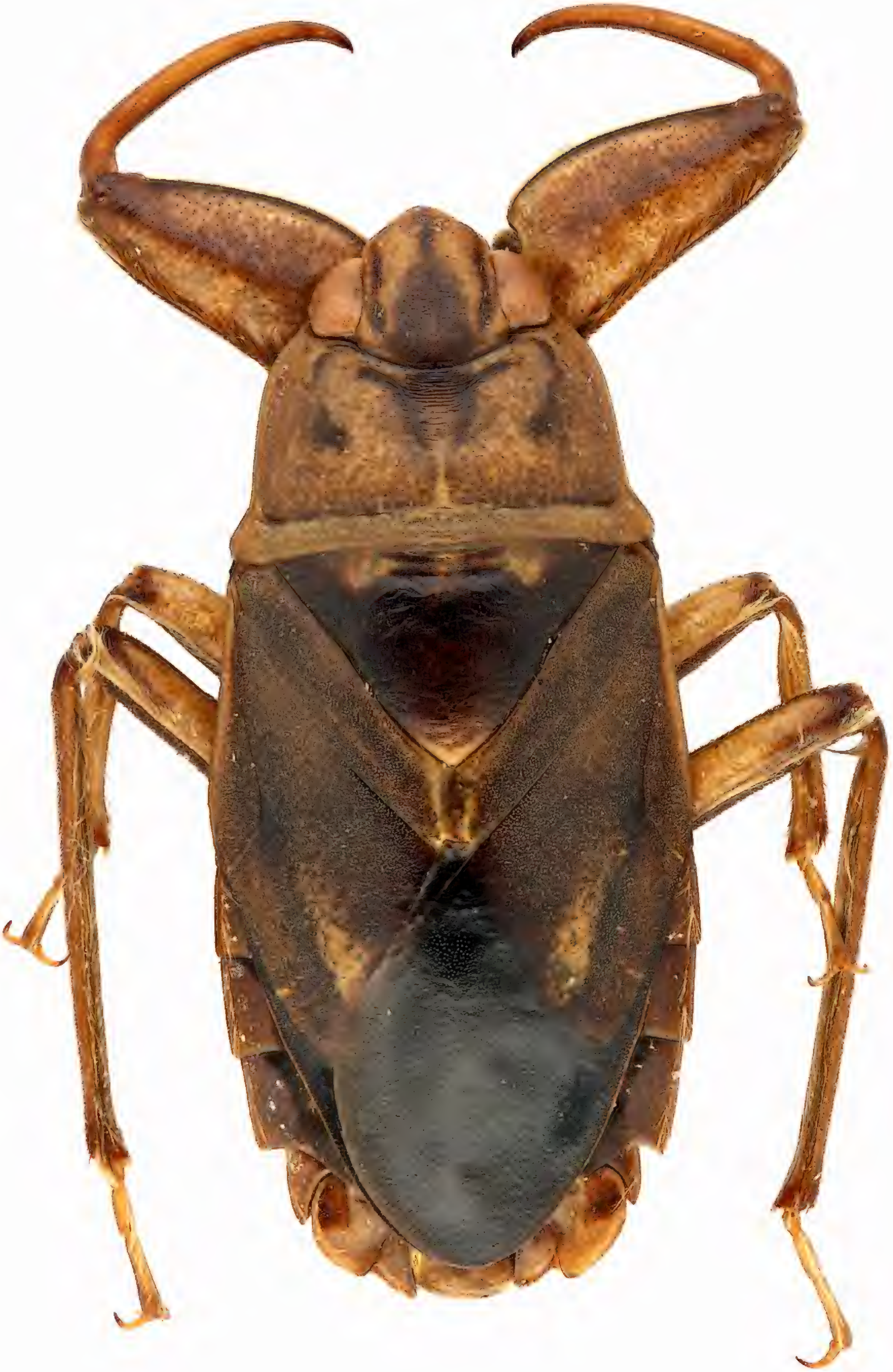


Figure 6. *Tanycricos cyclops* sp. nov., holotype macropterous ♂, habitus, dorsal view.

a base substrate of sand and gravel, at depths of 5–20 cm. The second author collected this species in company with other New Guinea endemic Naucoridae in the genera *Idiocarus* and *Cavocoris* La Rivers, 1971 while the first author – together with *Idiocarus* as well.
Distribution: Currently known only from Cyclops Mountains, northern New Guinea.

Annotated checklist of *Tanycricos* La Rivers, 1971 species

Species arranged alphabetically in the present list since a phylogenetic arrangement is not yet possible.

Naucoridae
Cheirochelinae Montandon, 1897
Tanycricini La Rivers, 1971
***Tanycricos* La Rivers, 1971**
La Rivers (1971: 4).
Type species: *Tanycricos usingeri* La Rivers, 1971 by original designation.

***Tanycricos acumentum* La Rivers, 1971**
La Rivers (1971: 5, 80, 103–104 & 107) original description, checklist, habitat photographs; Polhemus & Polhemus (1986: 165) key, additional description, records; D. Polhemus (1999a: 178) records; D. Polhemus *et al.* (2004: 40) note on predators; D. Polhemus & Allen (2007b: 891) note on predators.

***Tanycricos binarius* La Rivers, 1971**
La Rivers (1971: 8, 80 & 108) original description, checklist; D. Polhemus & J. Polhemus (1986: 165–166) key, additional description, records.

***Tanycricos cyclops* sp. nov.**
Described in the present paper.

***Tanycricos froeschneri* D. Polhemus et J. Polhemus, 1986**
D. Polhemus & J. Polhemus (1986: 165 & 171) key, original description; D. Polhemus *et al.* (2004: 25) distribution.

***Tanycricos inequalis* Sites, 2008**
Sites & Suputa (2008: 24) original description.

***Tanycricos jaetipi* D. Polhemus, 1999**
D. Polhemus (1999a: 171) original description.

***Tanycricos longiceps* La Rivers, 1971**
La Rivers (1971: 10, 80 & 109) original description, checklist; D. Polhemus & J. Polhemus (1986: 165 & 168) key, additional description, records; D. Polhemus (1999a: 179) record.

***Tanycricos usingeri* La Rivers, 1971**
La Rivers (1971: 13, 80 & 110) original description, checklist; D. Polhemus & J. Polhemus (1986: 165–166) key, additional description, records.

***Tanycricos ziwa* D. Polhemus, 1999**
D. Polhemus (1999a: 176) original description.

Updated key to *Tanycricos* La Rivers, 1971 species

The present key is partially based on La Rivers (1971) and D. Polhemus & J. Polhemus (1986), incorporating four additional species described subsequently to their publications.

1 Female left posterolateral angle of abdominal tergum V in dorsal view distinctly produced and asymmetrical; posterolateral angle of tergum VI not spinose; male abdominal tergum VI in ventral view with lateral projections overreaching beyond lateral margins of corresponding sternum 2
– Female abdominal tergum V not or weakly asymmetrical, if slight asymmetry present, then tergum VI spinose on posterolateral angles; male abdominal tergum VI in ventral view with lateral projections not overreaching lateral margins of corresponding sternum 3
2 Anteclypeus distinctly sinuate on anterior margin, slightly indentate on either side of apex; inner margin of mesotibia with erect slender spines; medial hump on male abdominal tergum VI not dentate apically; male left paramere strongly narrowed distally; female subgenital plate bifurcate for half its length, incision narrowing basally .... *acumentum* La Rivers, 1971
– Anteclypeus rounded on anterior margin, without lateral subapical indentations; inner margin of mesotibia not spinose; medial hump on male abdominal tergum VI dentate apically; male left paramere blunt, not strongly narrowed distally; female subgenital plate bifurcate for two thirds of its length, incision widening basally .... *binarius* La Rivers, 1971
3 Female abdominal tergum V with posterolateral angles acutely produced; male abdominal tergum VI with lateral projections rounded 4
– Female abdominal tergum V with posterolateral angles not produced, squared, nearly squared or rounded; male abdominal tergum VI with lateral projections squared off, acute or subacute 5
4 Female abdominal tergum VI with posterolateral angles acutely pointed; male abdominal tergum VI with distinct median hump on posterior margin; male left paramere acute angulate apically; female subgenital plate tapering evenly from base toward apex, with basally widened incision .... *longiceps* La Rivers, 1971
– Female abdominal tergum VI with posterolateral angles rounded; posterior margin of male abdominal tergum VI not humped; male left paramere broad, blunt, not acute angulate apically; female subgenital plate distinctly

narrowing on apical half, very narrowly bifurcate .... *froeschneri* D. Polhemus et J. Polhemus, 1986

5 Female abdominal tergum V with posterolateral angles squared to rounded; male abdominal tergum VI with posterolateral angles squared 6

– Female abdominal tergum V with posterolateral angles squared to subsquared (slightly less than right-angled); male abdominal tergum VI with posterolateral angles acute to subacute (broadly pointed as in the original description (Sites & Suputa 2008)) 8

6 Total body length under 15 mm; male left paramere comparatively longer and more slender, lateral tab not indicated; female subgenital plate with very broad and deep incision .... *ziwa* D. Polhemus, 1999

– Total body length over 17 mm; male left paramere comparatively shorter and less slender, lateral tab more or less strongly indicated 7

7 Total body length 19 mm or over; male left paramere with distinct lateral tab present; female subgenital plate with narrow, short, V-shaped incision .... *jaetipi* D. Polhemus, 1999

– Female abdominal tergum V with posterolateral angles not produced, squared to rounded; male abdominal tergum VI with posterolateral angles squared; body large and robust (total body length over 17 mm); male left paramere moderately slender, comparatively short, with marginal lateral tab present, not curved, apex rounded, not bent with regard to its axis .... *usingeri* La Rivers, 1971

8 Female abdominal tergum V with posterolateral angles subsquared (slightly less than right-angled); male abdominal tergum VI with posterolateral angles acute; body less robust, total length under 16 mm; male left paramere slender, comparatively longer, lateral tab absent, irregularly curved, with apex rounded and bent interiad towards median lobe with regard to its axis .... *cyclops* sp. nov.

– Female abdominal tergum V with posterolateral angles squared; male abdominal tergum VI with posterolateral angles subacute; body total length under 15 mm; male left paramere short and broad, lateral tab absent, obtusely pointed apically .... *inequalis* Sites, 2008

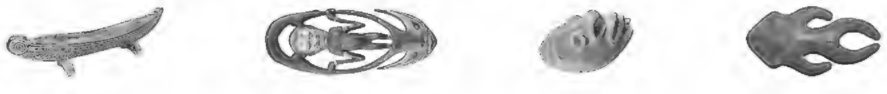
Discussion

Tanycricos was long considered to be restricted to the Central Cordillera of New Guinea (La Rivers 1971; D. Polhemus & J. Polhemus 1986; D. Polhemus 1999a; D. Polhemus & Allen 2007b). Based on the data available at that time (six species of *Tanycricos*) D. Polhemus (1996) postulated that ancestors of this taxonomic group likely arrived via a "Papuan arc", a terminology introduced by Kroenke (1984) but not widely utilized by later authors (for instance, Baillie *et al*. 2004; Cloos *et* al. 2005; Baldwin *et al*. 2012; Hall 2012), who presented alternative terminologies for the same set of terranes accreted in the Eocene (for a review of the competing models of New Guinea's tectonic assembly see D. Polhemus 2007). However, with discovery of *T. inequalis* Sites, 2008 in the Arfak Mountains of the Doberai Peninsula (Sites & Suputa 2008) and *T. cyclops* sp. nov. from the Cyclops Mountains, central northern New Guinea, it has became evident that the biogeographic history of *Tanycricos* is more complex than previously appreciated. It is possible that *Tanycricos* may have evolved on an offshore oceanic arc now accreted to northern New Guinea as a series of terrains including the Finisterre, Adelbert, Bewani-Toricelli, and Cyclops mountains, although the genus is at present known from only the latter north coast terrane. Alternately, the original hypothesis of D. Polhemus (1996) may be correct, with the genus having evolved on a set of Eocene terranes now incorporated into the New Guinea central highlands, with subsequent dispersal to other terranes, such as Doberai and Cyclops, that were accreted in the Miocene or later.

Whatever the underlying processes responsible, the present range of *Tanycricos* is discontinuous, with seven of the nine known species inhabiting New Guinea's 1300 km long and about 150 km wide fold-and-thrust belt (Central Cordillera), one species inhabiting a microcontinent (Arfak Mountains of the Doberai Peninsula), and yet another one on an accreted island arc terrane (Cyclops Mountains).

As earlier postulated by D. Polhemus (1999b), the endemic complex of Papuan naucorid genera appears to represent a monophyletic radiation from a single ancestral stock, and forming an evolutionary continuum, with the monophyly or paraphyly of the closely related Sagocorini La Rivers, 1971 with the Tanycricini not firmly established. For instance, the Sagicorini and Tanycricini were both identified as non-monophyletic groups within the recent comprehensive molecular phylogenetic study of aquatic Hemiptera (Ye *et al*. 2020), although this was based on limited taxon sampling.

As stated by earlier authors, *Tanycricos* species occur at altitudes over 1000 m (D. Polhemus 1999a; Polhemus & Allen 2007a & b; Sites & Suputa 2008) although D. Polhemus (2000) provided a wider interval of lower altitudes of 500–1000 m for two unspecified species of *Tanycricos* corresponding to *T. jaetipi* and *T. ziwa* (D. Polhemus 1999a), from upper course of the Wapoga River in Indonesian New Guinea. The present records from Cyclops Mountains, by contrast, come from 260 to 550 m elevation, which represents a new lower elevational



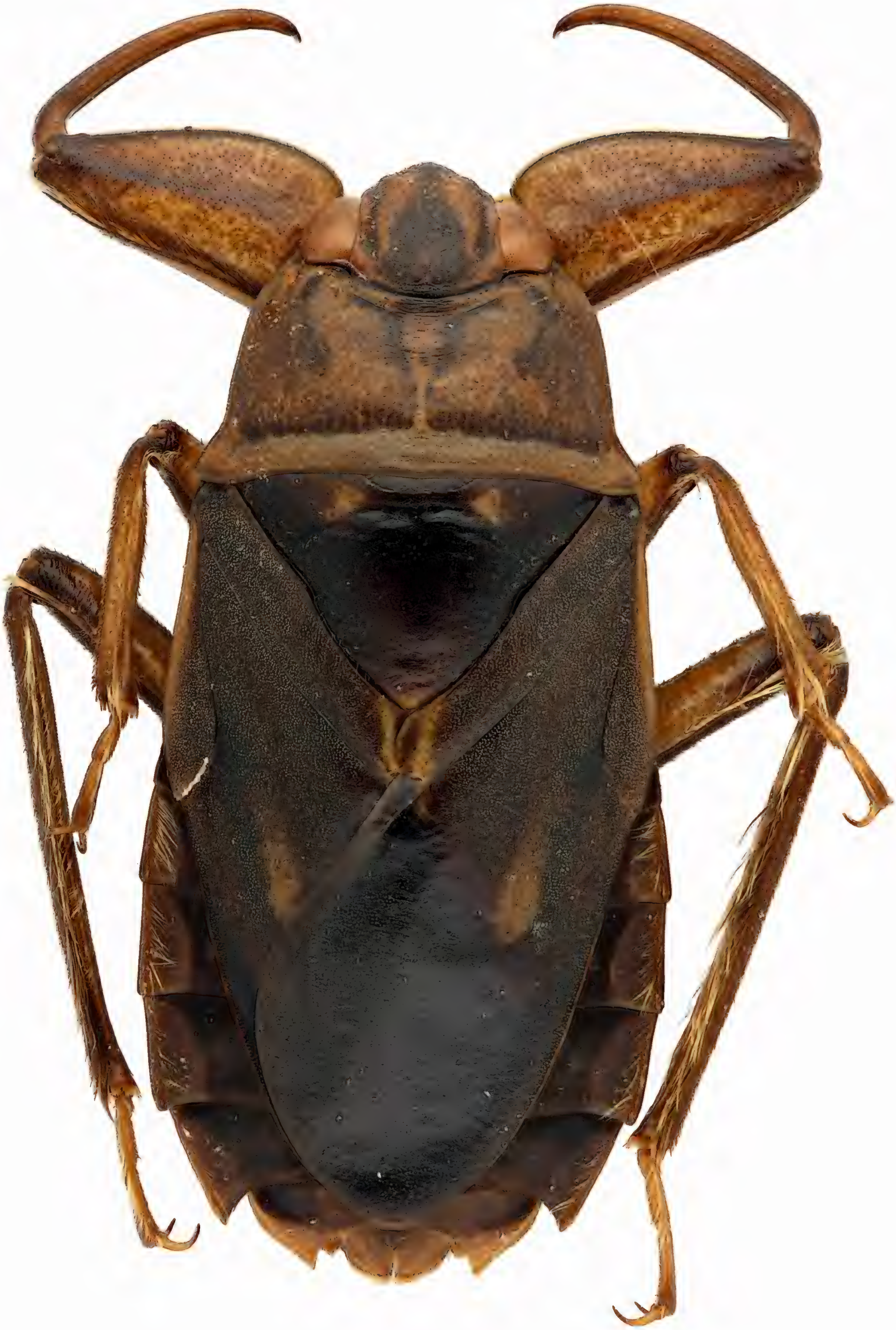


Figure 7. *Tanycricos cyclops* sp. nov., paratype macropterous ♀, habitus, dorsal view.

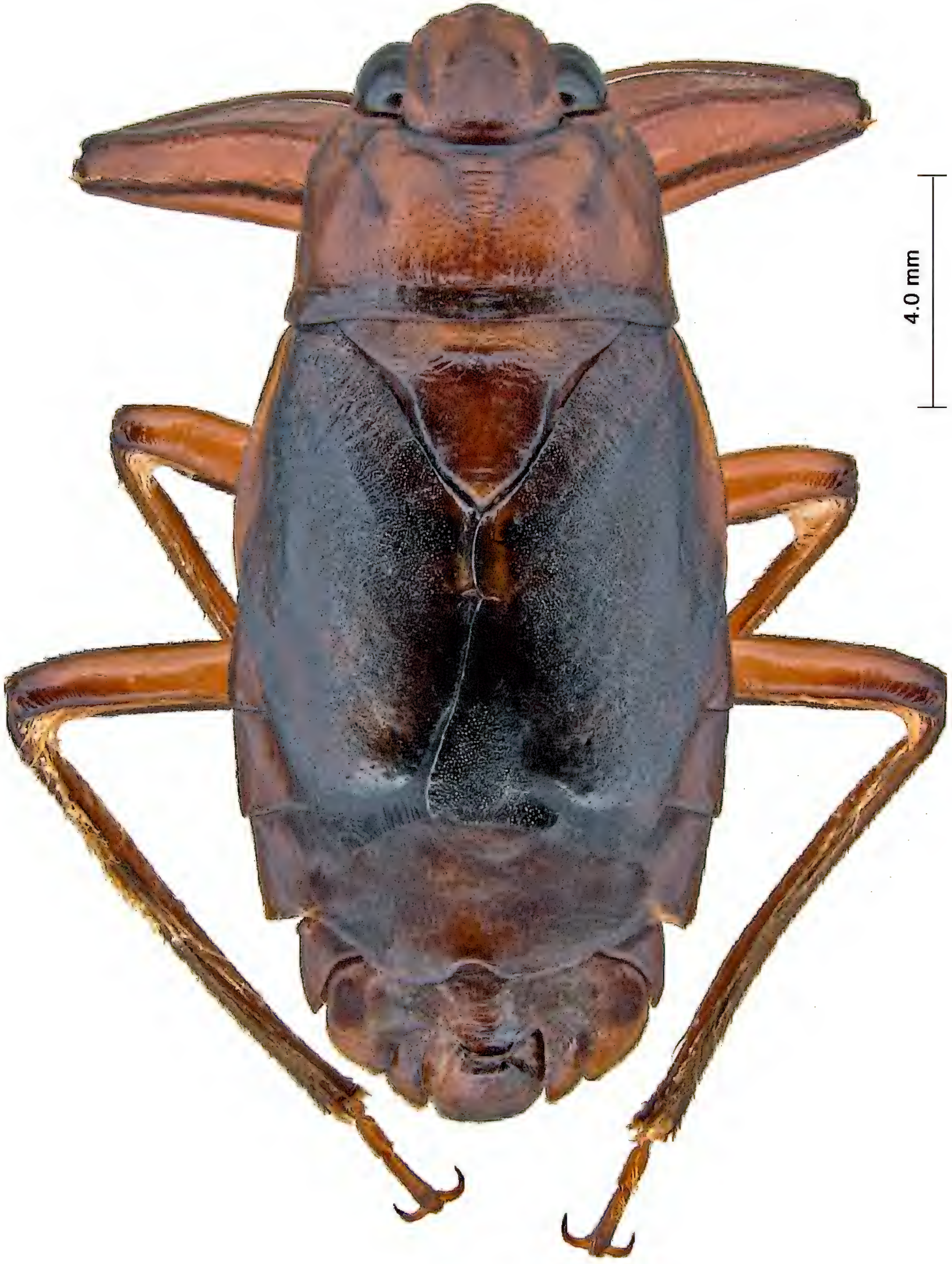


Figure 8. *Tanycricos cyclops* sp. nov., paratype brachypterous ♂, habitus, dorsal view.

bound for the genus. Nevertheless, considering the extremely steep gradient of the Cyclops Mountains, which along certain reaches exceeds 75% at the *T. cyclops* sp. nov. locus typicus and is nearly 90% a short distance uphill from this locality (large vertical waterfall), it should not be excluded that the type specimens were accidentally washed from higher altitudes of the mountains, although the collection of several instar stages of immatures at elevations as low as 260 m suggests that this species may be capable of breeding at such low elevations.

Tanycricos, and members of the Tanycricini in general, appear to be restricted to perennial streams (D. Polhemus & Allen 2007b; Sites & Suputa 2008; current publication). The present distribution of the genus comprises the Arfak Mountains (Doberai, Vogelkop, or Bird's Head, Peninsula), Central Cordillera and Cyclops Mountains (mainland New Guinea). It is likely that orogeny in the Central Range (tectonically defined as Central Range fold belt in Baillie *et al*. 2004) began in either the Late Cretaceous (100.5–66 Ma) or Early Eocene (54–58 Ma) (Cloos *et al*. 2005; Davies *et al*., 1996). Later Melanesian arc accretion in the Late Oligocene (27.8–24.5 Ma) – Miocene (23.03–5.333 Ma) (Baldwin *et al*. 2012) resulted in emplacement of the Cyclops Mountains (Cyclops ophiolite belt). The history of the orogeny in the Arfak Mountains of the Doberai Peninsula is complicated, involving collision between a fragment of the Australian craton-stable platform and the Arfak terrane (Toussaint *et al*. 2014). Considering present distribution of *Tanycricos* and different geological ages of the Central Cordillera, Arfak and Cyclops mountains, the sequence by which the genus colonized these disparate geological units is not yet fully understood.

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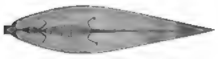

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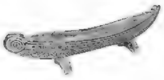
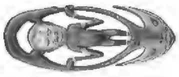
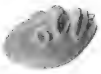
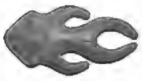
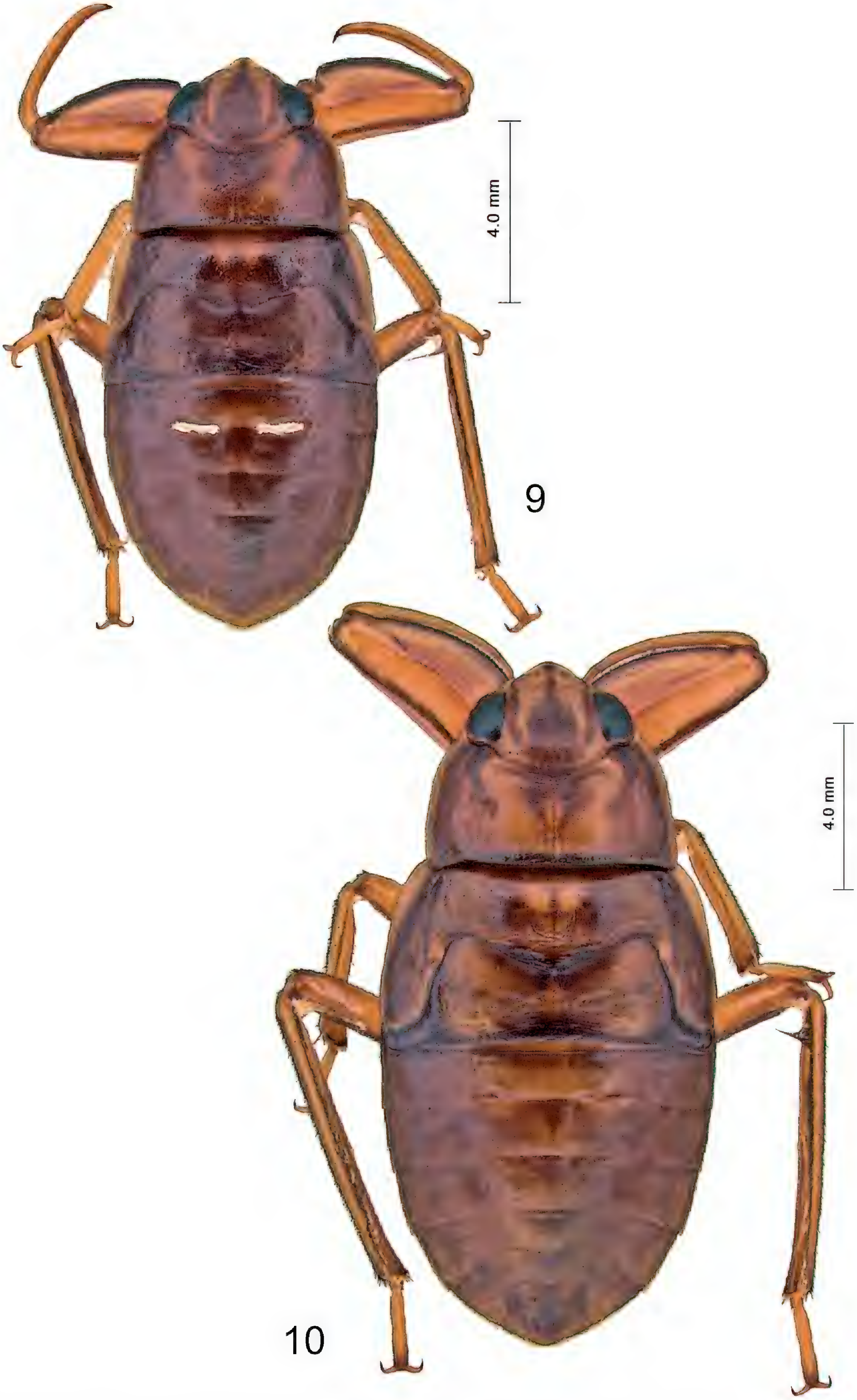
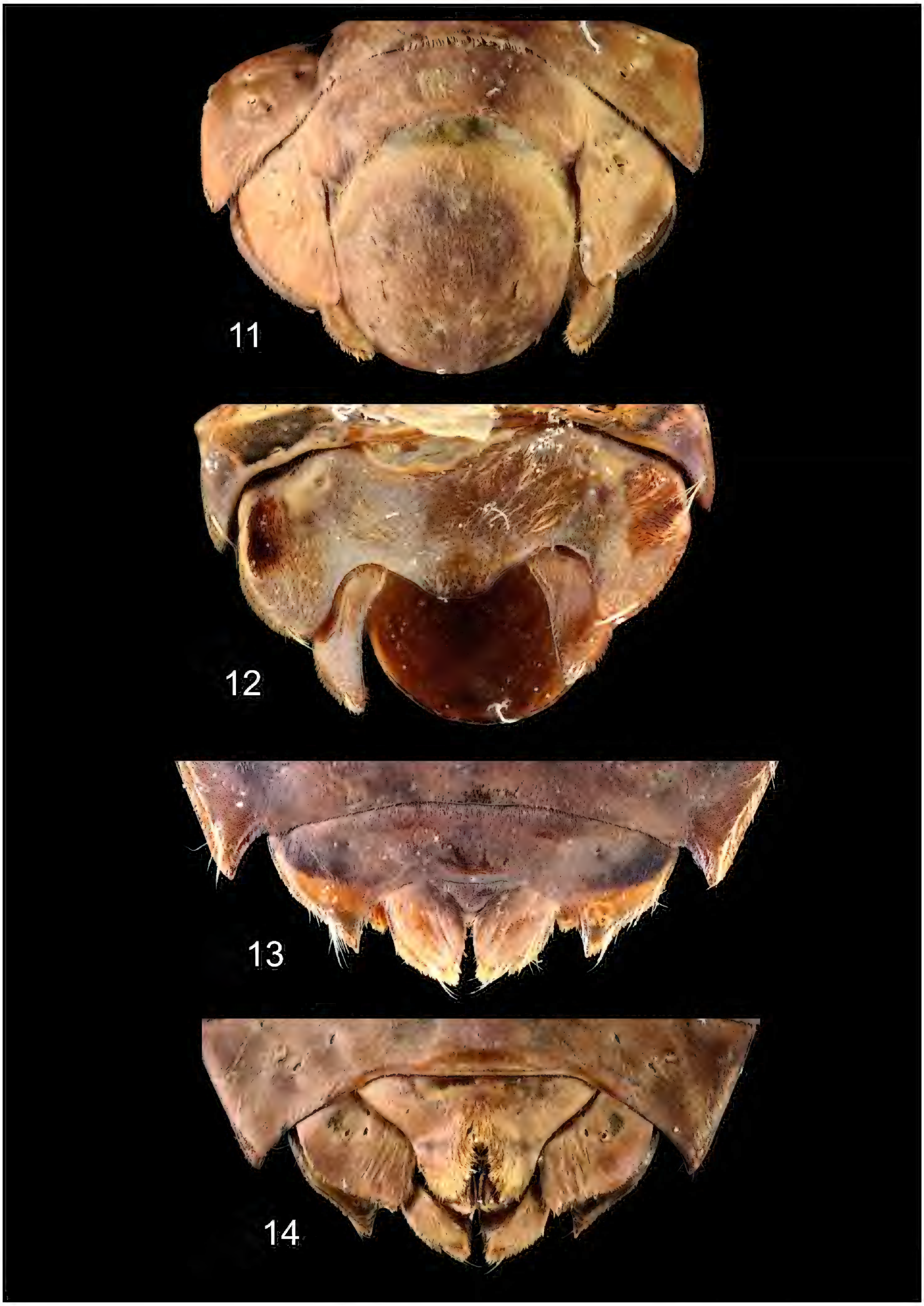
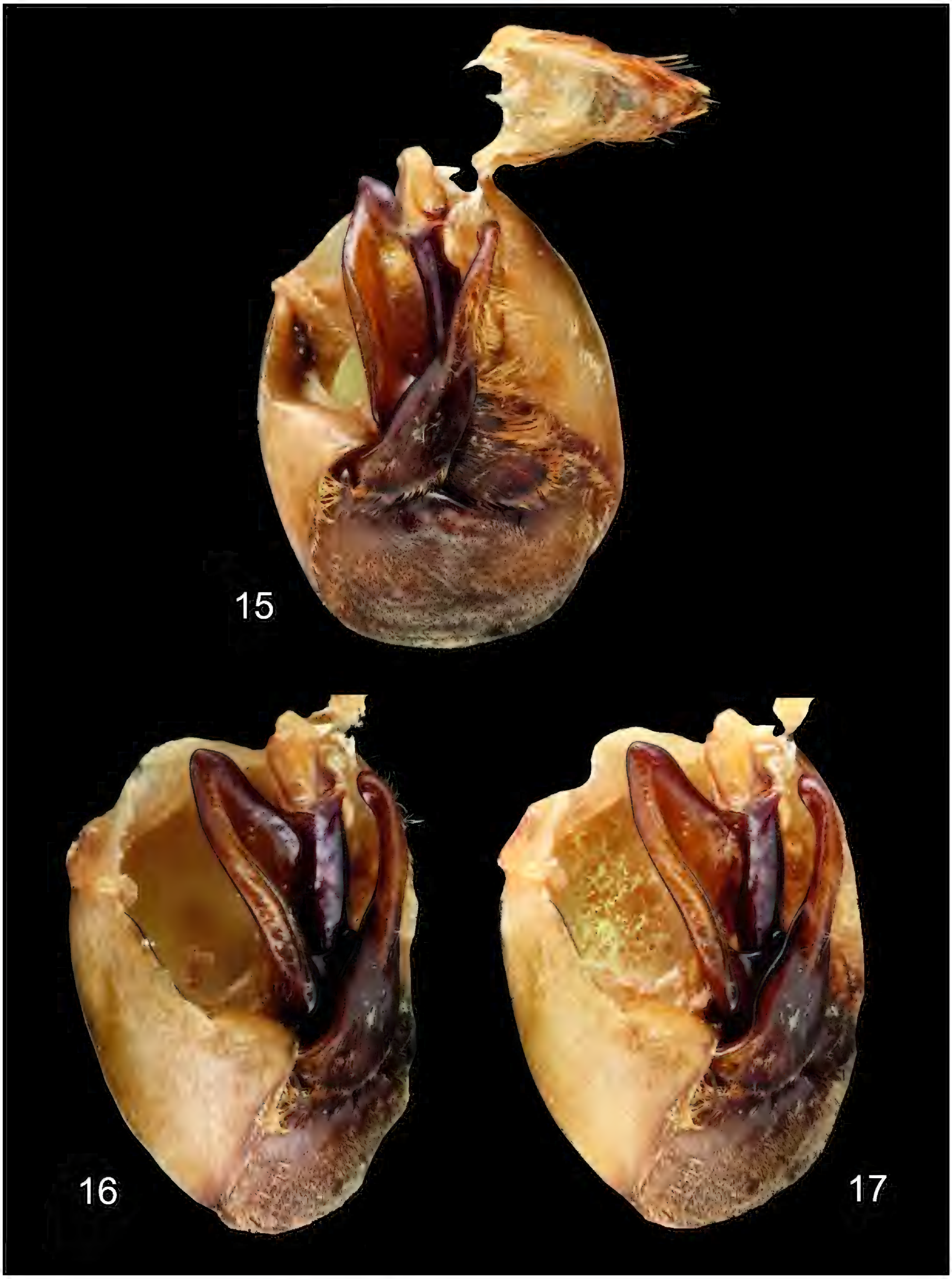







Figures 9–10. *Tanycricos cyclops* sp. nov., paratypes instars, dorsal view. 9 – 3rd instar immature; 10 – 4th instar immature.



Figures 11–14. *Tanycricos cyclops* sp. nov., terminal abdominal segments. 11–12 – Holotype ♂, dorsal (11) and ventral, genital capsule dissected (12) view; 13–14 –Paratype ♀ (including subgenital plate), dorsal (13) and ventral (14) view [not to scale].



Figures 15–17. *Tanycricos cyclops* sp. nov., holotype ♂, genital capsule and aedeagus, ventral (15) and lateroventral (16–17) view [not to scale].